AGRICULTURAL PESTICIDE RESIDUES IN CALIFORNIA WELL WATER: DEVELOPMENT AND SUMMARY OF A WELL INVENTORY DATA BASE FOR NON-POINT SOURCES

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EXECUTIVE SUMMARY

Sampling of well water for the presence of pesticide residues has increased in recent years with the awareness that industrial and agricultural chemicals have the potential to move through soils to ground water. However, an assessment of the overall problem of ground water contamination in California is difficult because sampling data are scattered throughout Federal, State and local governmental agencies. The California Department of Food and Agriculture has initiated a ground water protection project to minimize movement of pesticides to ground water during normal agricultural use. Thus, a need arose to centralize data from the various well water sampling programs into a standardized computer data base so that statistical and graphical analyses could be made.

This document outlines the activities conducted: to identify sources of data; to format and enter the data in a computerized data base (denoted in this report as the "well inventory data base"); and to assure quality of the data. The current content of the data base is also summarized.

Data were acquired from studies conducted by these agencies: U.S. Geological Survey, the California Department of Food and Agriculture, the Department of Health Services, the Department of Water Resources, the State Water Resources Control Board, Regional 1 and 4 Water Quality Control Boards, and the Fresno County Environmental Health Department.

Well water samples are generally considered to be an indication of the quality of ground water. To increase the likelihood that these well water samples reflected ground water, the procedures used for sampling in each study were examined so that data were included in the well inventory only if; 1) municipal well samples were taken at the well head, not at an outlet along the distribution line; 2) domestic well samples were obtained from unfiltered and untreated systems; and 3) well water samples taken by owners were obtained using proper sampling materials and methods.

The data base was developed to provide information on non-point source contamination of ground water by pesticides so samples were excluded if they were known to be associated with point source problems. And since the data base was designed to be used as a research tool, the location of wells had to be indicated by Township, Range and Section geographical coordinates, the most widely used coordinate system in the state.

Data that met these criteria were recorded in a computerized file according to a standardized format that included:

- well location in township/range/section coordinates
- date of sample collection (month/year)
- pesticide analyzed
- detected concentration in parts per billion (ppb)
- minimum detection limit in ppb
- county where sample was taken
- sampling agency
- street address (optional and confidential)
- well construction information when available

Some highlights of the contents of the data base are:

1. The well inventory data base currently contains information on over 10,000 samples taken from over 5,000 wells collected during the years 1975-1984.

2. In the data base, there are data for analyses of pesticide residues in well water for 26 of the 58 counties in California.

3. Pesticide residues were detected in well water samples in 15 of these 26 counties.

4. Data were collected for 34 pesticides and related chemicals, of which residues for 11 pesticides were detected in well water.

5. Based on information in the well inventory data base and data from other studies, we concluded that 5 of the 11 pesticides were present in well water as a result of non-point source agricultural use -

dibromochloropropane (DBCP), ethylene dibromide (EDB), 1,2-dichloropropane (1,2-D), simazine and aldicarb. Further investigation is required to determine whether residues in well water for the other 6 pesticides also originated from non-point sources.

6. Data for DBCP accounted for 67% of the records.

7. The geographical distribution of the sampling varied greatly between pesticides. For example, data for DBCP were available for 22 counties whereas data for aldicarb were available for only 3 counties.

8. Information on well construction that was usually taken from well logs was available for approximately 5% of the collected data.

Since the ground water protection project is concerned with non-point source contamination of ground water, data will be eliminated if a point source of contamination is identified as the causal agent for any recorded samples. Therefore, this summary will be periodically updated to reflect entry of new data and to describe investigatory work in progress to determine probable sources of contamination.

The data that comprise the well inventory were obtained from many different agencies. One result of this process was a notable lack in standardization in sampling techniques, chemical analyses and reporting techniques between the agencies as well as between studies conducted by a single agency. Therefore, the information provided by this data base merely serves to identify areas where residues of pesticides have been detected in well water. The lack of standardized techniques prohibits use of this data base in more complex analyses of movement of pesticides through soils.

ACKNOWLEDGEMENTS

Many people contributed to the development of the well inventory data base. We first and foremost thank all personnel at other federal, state and local agencies who cooperated during data collection. The development of the data base would not have been possible without their cooperation. Nancy Miller, Dave Sheeks, Dave Terry and Muffet Wilkerson provided valuable assistance in creating and maintaining the computer files. Linda Heath and Elizabeth Onslott developed the graphics. And, lastly, the comments of the reviewers, Mary Brown, Kathy Brunetti, Ron Oshima, Peter Stoddard and Don Weaver were greatly appreciated.

DISCLAIMER

The mention of commercial products, their source or their use in connection with material reported herein is not to be construed as either an actual or implied endorsement of such product.

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I. INTRODUCTION

Prior to 1979, there was very little sampling for pesticide residues in California well water because pesticides were not suspected of having sufficient mobility and longevity to leach through soils to ground water. However, the 1979 discovery of the soil fumigant, 1,2-Dibromo-3-chloropropane (DBCP) in well water in Lathrop, California, triggered several agencies to conduct well sampling programs.

The Department of Health Services (DHS) has undertaken several well monitoring studies since 1979. To date, their most extensive survey has been concerned with monitoring for DBCP residues in well water. Samples have been taken from over 3,000 wells in 17 counties. Currently, DHS is involved in a statewide sampling program of municipal and rural well water, which includes screening for pesticides.

Several other state agencies have also sampled well water for pesticide residues: The California Department of Food and Agriculture (CDFA) has sampled wells for the presence of DBCP, ethylene dibromide (EDB), simazine, carbofuran, aldicarb and other pesticides; The North Coast Regional Water Quality Control Board (NCRWQCB) has conducted an intensive study of 1,2-dichloropropane (1,2-D) and aldicarb residues in wells in Del Norte County and; The State Water Resources Control Board (SWRCB) has sampled wells for many pesticides throughout the state, including 1,2-D, 1,3-dichloropropene (1,3-D) and EDB. Most of these sampling studies were conducted solely to determine the presence or absence of pesticide residues in municipal and domestic wells, and did not address any long-term, research-oriented goals, such as determining how pesticides had entered the wells, or possible preventative measures.

The data for these studies are not stored in one central location, but they are scattered throughout the state either in agency-published reports or filed in offices as unpublished data sheets. The EPA's computer-based STORET system was developed to centralize this information. However, since data are unsolicited, many agencies have not provided STORET staff with well monitoring data. Also, a problem arises with quality assurance because agencies providing the data do not consistently edit or verify the data after entry. According to a 1984 report from

the SWRCB (Cohen and Bowes, 1984), nearly 75% of previously reported pesticide well residues stored in the STORET data base could not be verified, and, therefore, may be unreliable.

The Environmental Hazards Assessment Program of CDFA has initiated a project to collect information on contamination of ground water by use of pesticides from non-point sources. The goal of the project is to produce recommendations for environmentally safe use of pesticides. Owing to the problems encountered with STORET data, an independent data base was developed to provide an accurate assessment of current contamination of ground water from non-point sources of pesticide use, e.g., contamination that results from normal pesticidal applications. Agencies were contacted and requested to provide available data from sampling programs conducted to detect pesticide residues in well water samples. The information was then centralized into one standardized, computerized file so that the data base could be used as a research tool. A complete list of studies included in the well inventory data base is given in Appendix A.

This document explains the acitivities involved in collecting and formatting the data into the data base and summarizes its current contents.

II. MATERIALS AND METHODS

A. Identification of Data Sources

Agencies with pesticide monitoring and sampling information on well water samples taken from California municipal, domestic or agricultural wells were identified and contacted. The following federal, state and county agencies had data entered into the CDFA well inventory: the United States Geological Survey (USGS) and the California Department of Water Resources (DWR) data stored in the STORET system; California Department of Food and Agriculture (CDFA), both the Worker Health and Safety and the Environmental Hazards Assessment Programs; California Department of Health Services (DHS)- Sanitary Engineering Branch; State Water Resources Control Board (SWRCB); Region 1 and 4 Water Quality Control Boards (RWQCB); and the Fresno County Environmental Health Department.

The information was scattered throughout the state in various stages of accessibility so a considerable amount of time was spent identifying and locating the data. Additionally, the data from each study were evaluated to determine whether it pertained to ground water or surface water studies, whether the residues originated from a point source (e.g., leaky storage ponds) or non-point source, and whether the chemical was of industrial or agricultural importance.

B. Data Collection

Specific criteria were developed to determine whether data should be obtained and entered into the computerized data set. They were:

1. Samples were included if they were known to be associated with a non-point source as opposed to a known point-source. If the source of contamination was unknown, the data were still collected for later investigation;

2. Municipal well samples had to be taken from the well head, as opposed to an outlet somewhere along the distribution line;

3. Samples taken from domestic wells had to meet two criteria:

   a. Samples had to be obtained from an untreated and unfiltered system, because filtration or treatment could reduce or eliminate a chemical residue, and

   b. In order to provide some kind of quality assurance among samples, the collection apparatus had to have been supplied by the sampling agency. Therefore, sampling results from owner-sampled wells were included, provided instructions on proper sampling materials and methods had been given to the well owner by an appropriate agency.

4. The location of each well sampled had to be minimally identified by township/range/section according to the USGS Public Lands Survey Coordinate System (Davis and Foote, 1966). This requirement enabled an evaluation of ground water contamination using other spatially distributed data sets.

Data were verified as meeting these criteria either by visual analysis of reports or, in the case of unpublished lab sheets, verbal affirmation by appropriate agency staff. Data that met the criteria were collected and coded into the proper format. This process required a significant amount of interagency cooperation. If a study was small, the contributing agency often photocopied and submitted the information. The data was then coded or set aside until missing information was located. For larger studies, CDFA staff traveled to other agency offices either to obtain photocopies or to transcribe information directly onto computer coding sheets.

Data were omitted if they were associated with potential point sources, such as formulation plants, leaky storage ponds of waste water, or improper disposal sites of pesticide containers were omitted. These areas are regulated by the SWRCB, and were therefore inappropriate to include in a CDFA regulatory strategy to prevent ground water contamination from pesticides.

Once data were collected, verified and transcribed onto coding sheets (Appendix B), the information was entered onto floppy disk storage on an Apple II at CDFA

headquarters in Sacramento. These files were then proofread against the coding sheets, and edited as necessary. Individual files were transferred for storage to a PDP 11/23+ minicomputer in Riverside, CA.

Samples located only by address were stored for inclusion in the well inventory at a later date when their township/range/section location was identified. Also, new sampling or monitoring information will be added when available.

C. Format of the Data Base

Each chemical analysis for a pesticide residue in a well water sample constituted one record in the data base. Each record was formatted into 80 columns as follows (Appendix B):

a. Township/Range/Section/Tract (T/R/S/Tr) (Cols. 2-10): This is the U.S. Geological Survey's Public Lands Survey Coordinate System (Davis and Foote, 1966) used by DWR to numerically identify individual wells. Township lines (T) are oriented from north to south and are 6 miles long. Range lines (R) are oriented east to west and are 6 miles wide. A 6 x 6 mile township is divided into 36, 1 mile by 1 mile sections (S), numbered consecutively from 1 to 36. Each section is again divided into 16 individual 40 acre tracts (Tr) that are identified by letters. In some cases, wells in a tract are further identified with a sequential number in the order of identification by DWR. Most municipal wells had this last number, while most private wells did not.

   Many sampled wells had their T/R/S/Tr location indicated on data sheets or in a final report. Municipal well T/R/S/Tr locations were found by cross-referencing the name of the well and the water district to the well number on the DHS location file (denoted SWQIS), which lists municipal wells by district, county, station name, well name and/or number. Tract letter and numbers were included when available. Private wells lacking the T/R/S/Tr location were omitted from the main file because it was not possible to locate them accurately. For pesticide samples lacking T/R/S location, the data were collected but filed separately.

b. Date (Cols. 11-14): Only month and year were noted. This was usually the recorded sampling date, as given in a data sheet or report. For a well sampled more than once a month, each month's results were averaged, and indicated with an A (average) in the value code column. For studies indicating only a season, e.g., "all samples were taken in spring of 1982", the middle month of the indicated periods was used. However, most studies had the precise sampling date recorded.

c. Chemical code (Cols. 16-20): Each chemical was assigned a 5 digit chemical code, corresponding to the chemical code used in the Pesticide Use Reporting System and maintained by the Information Services Unit, CDFA. Breakdown products of pesticides were included, and were specially marked with an asterisk to distinguish them from the parent compound, e.g., 00262 = endrin, *0262 = endrin aldehyde. This list will be updated periodically to include new pesticides sampled in well water. See Appendix C for current list of chemical codes in the well inventory.

d. Chemical concentration (Cols. 21-26): Analytical results were recorded in parts per billion (ppb), weight per volume (w/v) and in scientific notation. Trace amounts, non-detected, or less than the minimum detectable limit were all recorded as non-detected (0.00+0).

e. Value code (Col. 27): "O" (Observation) signified samples with single values, i.e., one sample per well per chemical per month. "A" (Average) signified multiple samples taken each month and averaged or; multiple samples taken daily and averaged or; multiple samples taken at different depths, if taken in the same month for the same chemical.

f. Minimum detection limit (MDL) (Cols. 28-33): The MDL for the chemical assay was recorded in ppb. The MDL varied for the same compound by laboratory, date, or year, reflecting differences in analytical techniques. These values were not always available. Special attention should be paid to this information because the significance of a result should be weighed against the MDL recorded.

g. Agency code (Cols. 35-37): Numbers were assigned consecutively to agencies as information was obtained. Refer to Appendix C for the list of agency codes used in the data base.

h. Study code (Cols. 38-39): Numbers were assigned consecutively as studies were obtained (Appendix A).

i. County code (Cols. 40-41): Initially the 3-digit Federal code was used to coincide with the STORET data format, but this has been changed to the 2-digit state code to coincide with the CDFA Pesticide Use Report format (Appendix C).

j. Street number and street address (Cols. 42-54): Most street numbers were five digits or less. Street numbers larger than six digits were continued into the spaces allowed for the street name and the street name was truncated, not abbreviated. Street address was necessary to locate the well log, which provided information on well construction. Due to CDFA's policy on confidentiality, street address will not be made public.

k-o. Well information (Cols. 56-72): Water well drillers reports, or well logs, contain valuable well construction information that characterizes a particular well, e.g., well depth and type of well are recorded. Information from well logs was included in only a few studies, probably because well logs had not been filed for many wells (mostly private). Therefore, data on well construction was included when available.

k. Well depth (in feet) (Cols. 56-59): The total depth of a well, taken from a well log, was recorded, which was sometimes deeper than the depth of the completed well. Completed well depth usually corresponded to the lowest perforation depth, so if there was any doubt as to depth of well, the lower perforation depth was used.

l. Depth to top of perforation (in feet) (Cols. 60-62): Taken from a well log.

m. Depth to bottom of perforation (in feet) (Cols. 63-66): Taken from a well log and often corresponded to the depth of a completed well.

n. Depth of water in well after development (in feet) (Cols. 67-70): Obtained from well logs, or raw data, when available.

o. Log year (Cols. 71-72): Year the well was drilled. Information obtained from well log, raw data, or verbally by well owner.

p. Base Meridian (Col. 73): This information was needed to use the T/R/S coordinate system and it was determined from topographical quadrangle maps.

q. Well code (Col. 74): Most wells were identified by agencies as "D" signifying domestic or private wells; "M" signifying municipal; "I" signifying irrigation or agricultural wells; "B" signifying both agricultural and domestic or; "U" signifying unknown type. Test wells drilled specifically for monitoring purposes were not included in the inventory because they were usually associated with a suspected point source of pollution.

r. File name code (Cols. 75-78): Data were initially entered into individual files approximately 200 records long. Studies longer than 200 records were continued in sequentially numbered files. File names were included to facilitate the tracing of data back to the original coding sheets or for locating individual records of interest in the main file for editing purposes. After editing, files were then appended into one main file.

III. RESULTS

The well inventory data base is summarized in three ways: A) a summary indicating the pesticide compounds that were sampled and those detected; B) a summary showing the counties where sampling had occurred and where pesticides have been detected in well water and; C) a yearly breakdown of pesticides sampled and detected.

As stated previously, each record in the well inventory represents one chemical analysis for a specific pesticide or related chemical in a well water sample. The exact number of individual wells included in the data base has not yet been determined because multiple entries were made for some individual wells. Multiple pesticide residue analyses may have been conducted on a single well water sample or sequential samples may have been obtained over time from an individual well. The extent of this problem will be indicated in revised editions of this summary.

Also, the well inventory does not represent all of the well sampling that has occurred in the state because:

a. Only sampling for pesticide residues was included in the data base;

b. Data that did not meet the specified criteria were excluded;

c. Data from suspected point source contamination (e.g., monitoring wells at formulation plants) were excluded.

A. Pesticides Included in the Well Inventory Data Base

Currently the total number of records entered into the inventory is 10,187. A breakdown of these records into the number of positive and negative entries for each pesticide is listed in Table 1. Data for 34 pesticides and related chemicals are represented in the data base. DBCP, EDB, 1,2-D, carbofuran and simazine accounted for 82% of the total records or 8,365 records. The data for DBCP accounted for the greatest portion of the entries (67% of the total records). Data for EDB, 1,2-D, carbofuran and simazine accounted for 6.7, 3.6, 2.3, and 2.3% of the total records, respectively.

Table 1. Number of negative, positive and total records for each pesticide or related chemical included in the well inventory data base.

PESTICIDE	RECORDS NEGATIVE	POSITIVE	TOTAL
aldicarb	38	42	80
aldrin	52	0	52
atrazine	3	0	3
carbofuran	237	1	238
chlordane	94	0	94
chloroform	1	15	16
1,2-D	256	110	366
1,3-D	130	0	130
cis/trans chloroallyl alcohol	7	0	7
2,4-D	2	0	2
DBCP	3120	3730	6850
DDD	92	0	92
DDE	92	0	92
D-D mix	17	1	18
DDT	94	0	94
dicofol	44	0	44
dieldrin	50	0	50
endosulfan	228	0	228
endosulfate	48	0	48
endrin	55	4	59
endrin aldehyde	48	0	48
ethylene dibromide (EDB)	640	39	679
fenamiphos	11	0	11
heptachlor	94	0	94
heptachlor epoxide	94	0	94
lindane	104	1	105
BHC isomers	144	0	144
methoxychlor	55	0	55
methylene chloride	1	0	1
PCP	14	3	17
silvex	5	0	5
simazine	226	6	232
tetradifon	44	0	44
toxaphene	95	0	95
TOTAL	6235	3952	10187

Positive Results;

Eleven out of the 34 compounds included in the data base were detected in well water samples. DBCP data alone accounted for 94% of the 3,952 total positive entries (Table 2). Positive results for the pesticides 1,2-D, aldicarb, EDB and simazine comprised 2.8, 1.1, 1.0 and 0.2% of the total positive records, repectively. It should be noted that the lists of the top five pesticide compounds with respect to the number of records entered for each pesticide and the number of positive results obtained for each pesticide were dissimilar (Table 3). The reason for the discrepancy probably lies in the design and magnitude of individual studies. For example, most samples for aldicarb were taken within a relatively small area in one county, so although they represent a small portion of the total records, the probability of detection was high. On the other hand, the sampling for carbofuran encompassed a larger area but only 1 out of 238 well water samples was positive. Therefore, it was difficult to compare the potential for each pesticide's movement through soil solely using this data base.

Only 5 of the 11 pesticides with positive well water samples have been linked to non-point agricultural sources - 1,2-D, EDB, simazine, DBCP and aldicarb. Independent studies have provided evidence for the movement of some of these pesticides. Soil core studies have detected the presence of 1,2-D, EDB, and simazine in lower layers of soil (Cohen et. al., 1983; Zalkin et. al., 1984). In contrast, the large number of positive results for DBCP and the large geographical area encompassed by the data strongly indicated a non-point agricultural source for that pesticide. The positive data for aldicarb represented a unique case study because the data were obtained from a small but intensively studied area with shallow ground water.

Investigations are in progress to determine the significance of the positive results for the other 6 pesticides. First, the reliability of the data will be investigated. Data for endrin, lindane and PCP were obtained from the STORET data base which has been shown to contain unverified data (Cohen and Bowes, 1984). Second, when positive results are verified, on-site visits will be made to identify probable sources of contamination.

Table 2. The relative number of positive records for each pesticide expressed as a percentage of the total number of positive records for all pesticides.

PESTICIDE	POSITIVE RECORDS AS A PERCENT OF TOTAL POSITIVE RECORDS[a]
DBCP	94.38
1,2-D	2.78
aldicarb	1.06
EDB	.99
chloroform	.37
simazine	.15
endrin	.10
PCP	.08
D-D mix	.03
carbofuran	.03
lindane	.03
TOTAL	100.00

[a]Total number of positive records for all pesticides was 3952.

Table 3. Relative occurrence of the top five pesticide compounds with respect to the total number of records collected and the number of positive entries.

PESTICIDE	TOTAL NUMBER OF POSITIVE AND NEGATIVE RECORDS	PESTICIDE	NUMBER OF POSITIVE RECORDS
DBCP	6850	DBCP	3730
EDB	679	1,2-D	110
1,2-D	366	aldicarb	42
carbofuran	238	EDB	39
simazine	232	simazine	6

B. Pesticide Sampling by County

Data for well water samples were obtained for 26 of the 58 counties in California (Figure 1). Because sampling programs differed in design and area encompassed, the number of pesticides sampled and the number of samples taken during the years 1975 to 1984 varied among counties. A summary of pesticides sampled in each county is given in Appendix D. The greatest number of analyses were conducted for well water samples taken in Fresno county which represented 49% of the total records. Merced and Stanislaus counties ranked second and third with 11 and 10% of the total records, respectively. In these counties, the pesticides that accounted for the greatest portion of samples taken were DBCP, EDB and 1,2-D.

Positive Results;

Positive results were indicated in 15 of the 26 counties where sampling was conducted (Figure 1). The most extensively detected pesticide was DBCP which was found in samples taken from 13 counties (Figure 2). Fifteen or more pesticides were surveyed in 8 counties (Table 4). The highest number of pesticides found in one county was in San Joaquin County where 5 different pesticides were detected out of 10 surveyed (Table 4).

C. Yearly Summary

Only a small amount of sampling data was available from 1975 to 1978 (Table 5). However, the yearly total of records from 1979 to 1983 varied between 1000 and 2000 samples with the exception of one year, 1982. In 1982, 3987 samples were collected mainly due to a large amount of sampling data for DBCP in Fresno County well water. The number of samples collected for 1984 fell to a total of 231 samples.

A further summmary of the yearly sampling for each pesticide in each county is given in Appendix E. Pesticide residues were indicated in well water samples in all of the 8 years they were sampled in Fresno and Tulare Counties (Table 6). Ten other counties also had some indication of pesticide residues in well water samples in each year that sampling took place. (The sampling periods for these ten counties varied from one to six years.)

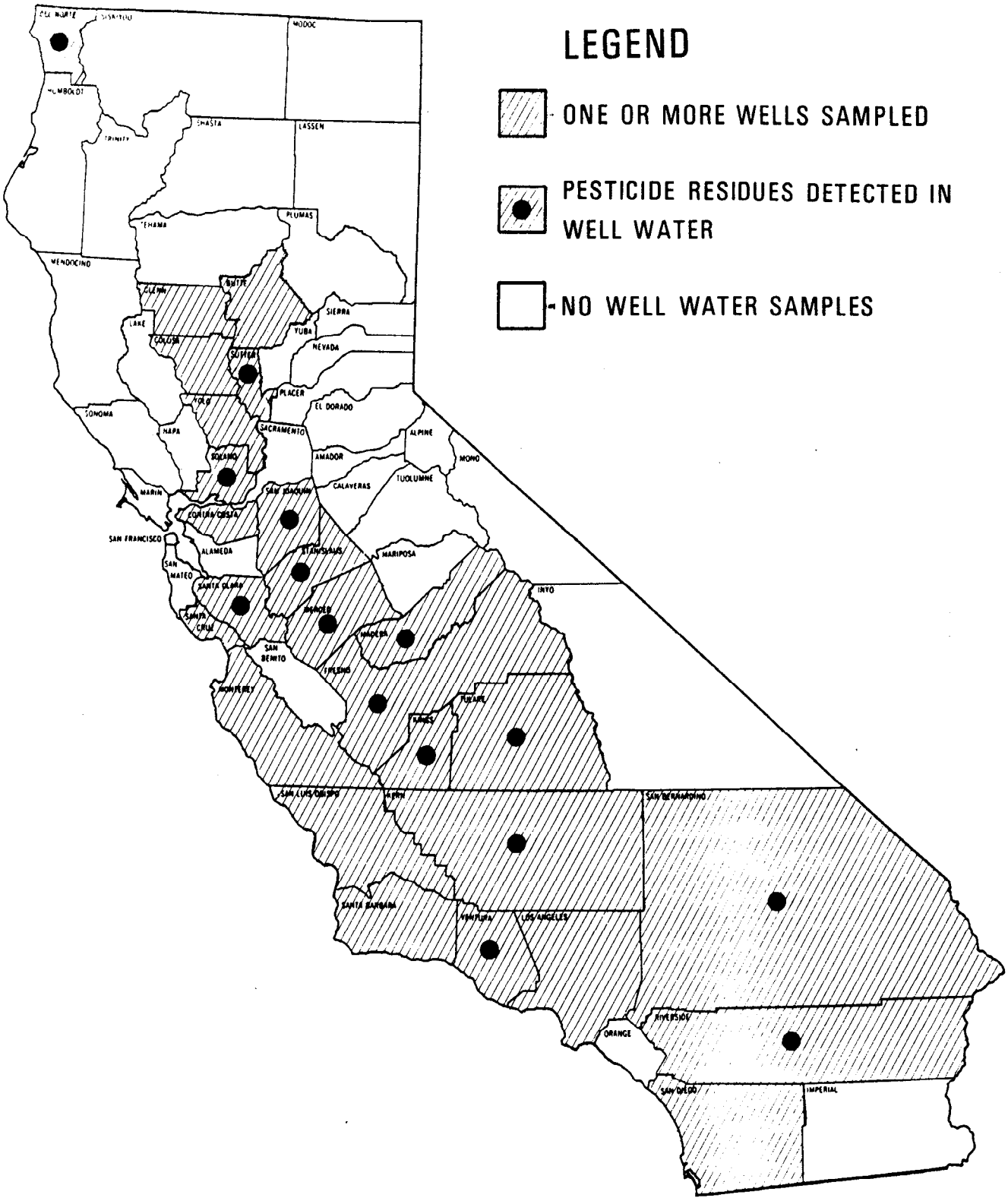

Figure 1. Counties in California that were sampled for pesticide residues in well water from 1975 to 1984.

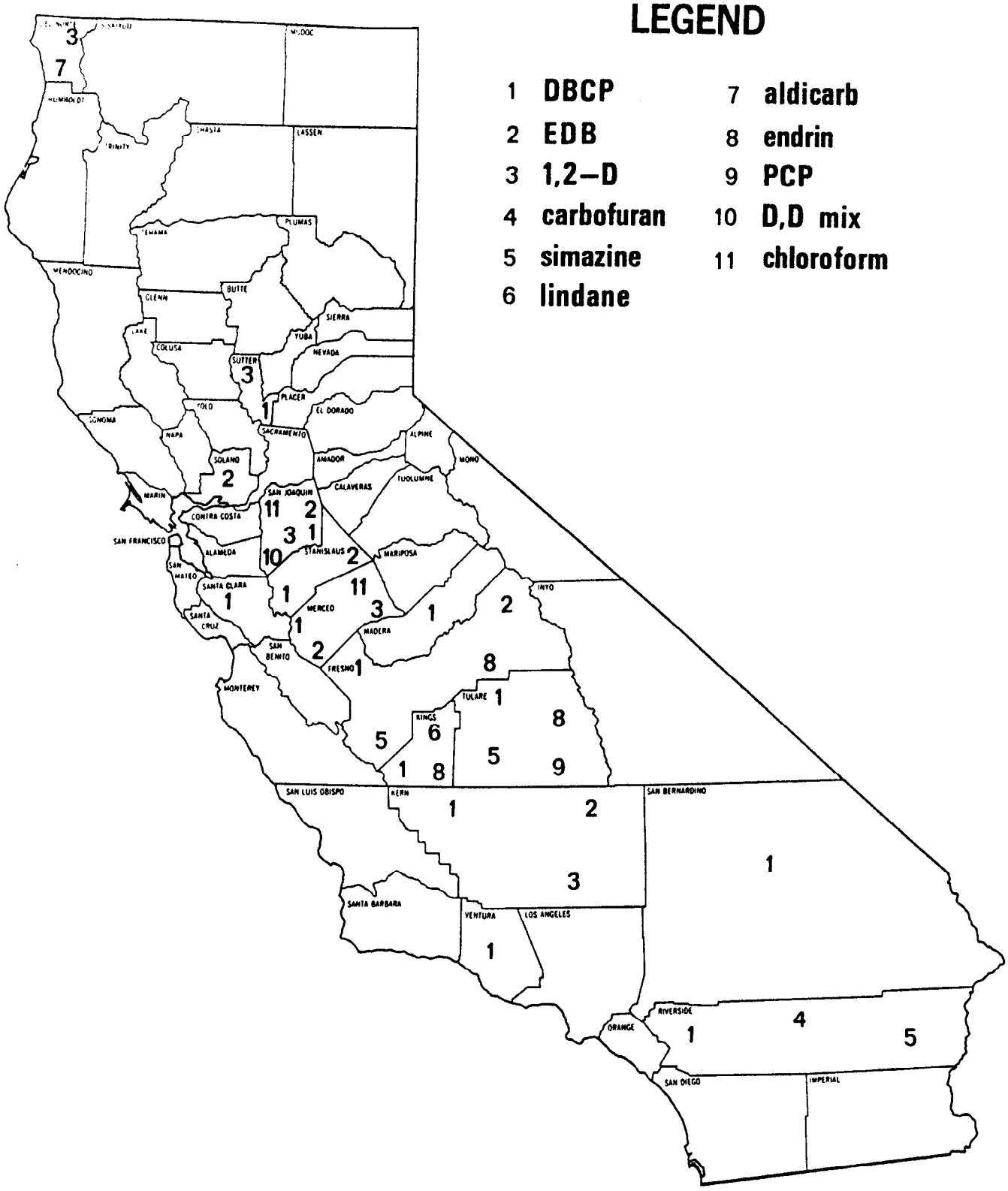

Figure 2. Distribution of eleven pesticide residues detected in well water in California counties from samples collected from 1975 to 1984.

Table 4. Numbers of pesticide compounds surveyed for presence of residues in well water samples collected from 26 counties.

COUNTY	NUMBER OF POSITIVE PESTICIDES[a]	TOTAL NUMBER OF PESTICIDES[b]
Butte	0	1
Colusa	0	1
Contra Costa	0	4
Del Norte	2	3
Fresno	4	20
Glenn	0	1
Kern	3	9
Kings	3	6
Los Angeles	0	15
Madera	1	16
Merced	4	22
Monterey	0	6
Riverside	3	18
San Bernardino	1	4
San Diego	0	1
San Joaquin	5	10
San Luis Obispo	0	4
Santa Barbara	0	5
Santa Clara	1	1
Santa Cruz	0	4
Solano	1	1
Stanislaus	2	19
Sutter	2	2
Tulare	4	22
Ventura	1	19
Yolo	0	5

[a]Number of pesticide compounds with positive results for residues in well water.
[b]Number of pesticide compounds tested for residues in well water samples.

Table 5. Yearly summation of the number of negative and positive records in the well inventory data base.

YEAR	RECORDS		
	NEGATIVE	POSITIVE	TOTAL
1975	16	1	17
1976	25	2	27
1977[a]	0	0	0
1978	0	5	5
1979	1282	459	1741
1980	458	625	1083
1981	611	947	1558
1982	2798	1189	3987
1983	936	602	1538
1984	109	122	231

[a]No records for 1977 were included in the well inventory data base.

Table 6. Numbers of years from 1975 to 1984 in which well water samples were collected and pesticide residues were found in 26 California counties.

COUNTY	NUMBER OF POSITIVE YEARS[a]	TOTAL NUMBER OF YEARS SAMPLED[b]
Butte	0	2
Colusa	0	1
Contra Costa	0	1
Del Norte	2	2
Fresno	8	8
Glenn	0	1
Kern	6	6
Kings	3	5
Los Angeles	0	1
Madera	5	6
Merced	6	6
Monterey	0	3
Riverside	2	2
San Bernardino	1	1
San Diego	0	1
San Joaquin	6	6
San Luis Obispo	0	2
Santa Barbara	0	4
Santa Clara	1	1
Santa Cruz	0	1
Solano	1	1
Stanislaus	6	6
Sutter	4	4
Tulare	8	8
Ventura	1	3
Yolo	0	2

[a]Number of years in which pesticide residues were found in well water.
[b]Number of years in which well water was tested for pesticide residues.

IV. DISCUSSION

The well inventory data base was developed by the Environmental Hazards Assessment Program of CDFA: 1) to identify reliable information on the occurrence of non-point source contamination of ground water by the agricultural use of pesticides; and 2) to computerize the data base to allow for subsequent graphical and statistical analyses of the problem. This document is the first summary of the contents of that data base as of 7/31/85.

The well inventory data base contains data for 34 pesticides. Of these, 11 had positive results. However, non-point agricultural sources of contamination were confirmed for only 5 of the 11 pesticides - 1,2-D, EDB, simazine, DBCP and aldicarb. Investigations are in progress to determine the significance of the data for the other 6 compounds. First, the reliability of that data will be investigated; the results for endrin, lindane and PCP were obtained from the STORET data base which has been shown to contain unverified data (Cohen and Bowes, 1983). Second, on-site investigations will be conducted to determine probable sources of contamination for verified data. For example, data for chloroform were included because the sources of contamination were unknown. Chloroform, however, was primarily used as a grain fumigant so its introduction into well water from agricultural practices was questionable. The summary of the well inventory data base will be periodically revised to explain the results of these investigations and to indicate additions to the data base.

The well inventory data base, in essence, is a historical record of sampling efforts in California for pesticide residues in well water from 1975-1984. Because the sampling goals varied for each agency, the information that was obtained and recorded varied among the studies. Problems encountered in creating a standardized, computerized file from a compilation of well sampling data from these studies were:

1. There was no standard reporting format or sampling protocol among agencies. Many data did not meet the criteria for inclusion into the data base, e.g., no minimum detection limit or well information was available for many samples in the well inventory data records.

2. Sampling results often were only available from raw data sheets; no report was ever written. Unpublished studies conducted several years ago prevented collection of important information such as methods of analysis. It was therefore impossible to make any evaluation or comparison of the relative quality of data between studies.

3. Most of the sampling information was not accessible by computer. It was therefore necessary to manually code and transcribe data onto coding sheets before entry into a computer, a very time-consuming task that provided an extra source of error to data collection.

4. The state well number (T/R/S/Tr) was not always included with sampling results and the sampling site location was often noted only by street address. Initially, an effort was made to determine the T/R/S/Tr by cross-referencing the address to a county map, but this method proved to be too time-consuming and imprecise so it was abandoned. This was unfortunate because several thousand DBCP samples from the DHS survey could not be included in the inventory.

5. Less than 5% of the data contained information about the wells sampled, due to any one of the following reasons:

   - the sampling agency did not collect or record this information;
   - an attempt was not made to locate a well log for every sample in the inventory;
   - well logs did not exist.

6. Locating the well log that corresponded to the particular well of interest was often a difficult task because several well logs had the same well number but different addresses. This problem occurred when the tract letter and number were not included in the well number. In these cases, a precise street address was necessary for finding the corresponding well log. Also, an index that cross-referenced street address and state well number did not exist. Therefore, a well log was only easily obtained when

both the state well number and street address were known. Further complications occurred when the well was not located by address, but by distances from streets or ditches.

Even when well logs were located, some had incomplete information, e.g., perforation depths were not always recorded. If well type or year drilled was not recorded on the lab sheet or in the study, the well log for that address could not be used. These measurements could be important for analyzing not only how or why a particular well was contaminated, but how contamination could have been prevented.

7. Sampling sites were often located only by cross-streets, making it difficult to determine the correct address. This in turn made it impossible to find the corresponding well log. Also, several wells may have been located at the same address, e.g., both a domestic and an agricultural well, or an older and newer well.

8. Several problems were encountered in using the EPA STORET system. First, STORET information was unsolicited so the data base was incomplete. Second, there was no standard format for reporting the data; agencies had different reporting formats and data organization. Third, there was no standard procedure for verifying data after entry onto the data base; STORET staff return the print-out of entered data to the supplying agency, but most agencies neglect to edit, or verify, the print-out. Also, there was no way to determine whether the data in the STORET system was previously edited.

The use of the well inventory data base in an analysis of the problem of non-point source contamination of ground water by pesticides is limited by the lack of standardization in sampling techniques, chemical analyses and reporting techniques used in the studies. For example, comparisons of the occurrence of different pesticides cannot be accurately made because of differences in study design. Comparisons of pesticide concentrations in well water samples also cannot be accurately performed because of the lack of information on chemical analyses. However, the data can be used to indicate areas where pesticides have

been found in well water. This information can be used as a guide in the design of future studies.

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APPENDIX A

SUMMARY OF WELL STUDIES INCLUDED IN THE DATA BASE

Data from the following studies were included in the well inventory:

I. Department of Food and Agriculture (CDFA)

Agency No. 001: Environmental Hazards Assessment Program (EHAP)

Study No. 14. "MONITORING SELECTED GROUND WATER BASINS FOR THE PRESENCE OF ALDICARB", R.J. OSHIMA, G. TORRES, S.J. NELSON AND T. M. MISCHKE: Aldicarb study conducted in conjunction with SWRCB and DHS in Kern and Monterey Counties, November 1979; 14 wells sampled.

Study No. 13. "PESTICIDE MOVEMENT TO GROUND WATER, VOL. I: SURVEY OF GROUND WATER BASINS FOR DBCP, EDB, SIMAZINE AND CARBOFURAN", D.J. WEAVER, R.J. SAVA, F. ZALKIN AND R.J. OSHIMA: Counties in sampling were Contra Costa, Fresno, Kern, Kings, Madera, Merced, Monterey, Riverside, San Bernardino, San Joaquin, San Luis Obispo, Santa Barbara, Santa Cruz, Stanislaus, Tulare counties; May-July 1982; 217 wells sampled.

Study No. 25*. Sampling of individual wells, as requested. Yolo county, 1984: Dimethoate, Malathion, Molinate, MCPA, glyphosate; Tehama county.

Agency No. 002: Worker Health and Safety Program

Study No. 07. "A STUDY OF SAMPLES OF WELL WATER COLLECTED IN CALIFORNIA IN MAY 1979 FROM SELECTED AREAS WHERE 1,2-DIBROMO-3-CHLOROPROPANE (DBCP) HAD BEEN APPLIED TO SOIL DURING THE PERIOD FROM 1960 THROUGH JULY 1977 TO DETERMINE THE PRESENCE OF DBCP AND CERTAIN OTHER PESTICIDE RESIDUES", S.A. PEOPLES, K.T. MADDY, B. CUSICK, T. JACKSON, C. COPPER AND A.S. FREDRICKSON: Reports no. HS-623 and HS-623, DBCP well survey including analyses for EDB, 1,3-D, DDD, DDE, DDT, aldrin, chlordane, lindane, heptachlor, heptachlor epoxide, dicofol (kelthane), tedion, endosulfan and endosulfan isomers, pentachlorphenol; Fresno, Merced, Riverside, San Joaquin, Stanislaus, Tulare, Ventura, Yolo counties; 1979-1980.

Study No. 09. "ANALYSIS OF WATER FROM WELLS IN SELECTED CALILFORNIA COMMUNITIES FOR RESIDUES OF 1,3-DICLOROPROPENE, 27 ORGANOPHOSPHATES AND 23 CHLORINATED HYDROCARBONS USED AS PESTICIDES", K.T. MADDY, W.G. CUSICK, F. SCHNEIDER, H. FONG, D. CONRAD, S. FREDRICKSON AND S. MARGOTICH: Report no. HS-854, Telone, DD (also screened for 27 organophosphates and 23 chlorinated hydrocarbons) analyzed in wells in Fresno, Kern, Merced, San Joaquin, Santa Barbara counties; January 1981; 54 wells sampled.

Study No. 12. "A STUDY OF THE POSSIBLE PRESENCE OF CARBOFURAN AND ITS METABLOLITES IN GROUND WATER", K.T. MADDY, D. RICHMOND AND N. SIANI: Report no. HS-871, Carbofuran and its Metabolites analyzed in wells in Fresno, Kern, San Joaquin, Stanislaus, Tulare counties; 1981; 6 wells, 6 samples.

Study No. 08. "A STUDY AND ANALYSIS OF THE MIGRATION POTENTIAL OF ATRAZINE INTO SELECTED AQUIFERS IN SELECTED COUNTIES OF CALIFORNIA IN 1981", K.T. MADDY, F. SCHNEIDER, H.R. FONG AND A.S. FREDRICKSON: Report no. HS-890, Atrazine sampled in wells in Fresno, Merced, San Joaquin counties; 1981; 15 samples.

Study No. 10. "A STUDY OF GROUND WATER FROM SELECTED AREAS IN CALIFORNIA IN 1981 FOR CIS- AND TRANS-= CHLOROALLYL ALOCHOLS, THE PRIMARY DEGRADATION PRODUCTS OF 1,3-DICHLOROPROPENE (TELONE II)", K.T. MADDY, J.LOWE, A.S. FREDRICKSON AND S. MARGOTICH: Report no. HS-891 cis/trans chloroallyl alcohol analyzed in wells in Fresno, and Merced counties; June 1981; 8 samples.

Study No. 11. Report no. HS-1002(a): 1,3-D, chloroallyl alcohol and 49 organophosphates or chlorinated hydrocarbons; (summary of HS-854).

Study No. 06. Report no. HS-1123: EDB survey; Fresno, Kern, Merced, Monterey, San Diego, San Joaquin, Solano, Stanislaus, Ventura counties; June-August 1983; 130 wells.

Study No. 22. "A SURVEY OF WELL WATER IN SELECTED COUNTIES OF CALIFORNIA IN 1983 FOR POSSIBLE CONTAMINATION BY 1,2-DICHLOROPROPANE", C.SMITH, S. MARGETICH AND A.S. FREDRICKSON: Report no. HS-1160 1,2-D analyzed in wells in Fresno, Kern, Merced, Monterey, San Diego, San Joaquin, Solano, Stanislaus, Ventura counties; June-August 1983; 130 wells (same wells as in HS-1123).

II. Department of Health Services (DHS)

Agency No. 003:

Study No. 01. EDB Well Sampling in the Central Valley; Fresno and Kern counties; spring and summer 1983.

Study No. 02. Fruitvale Ground Water Quality Study (Kern county); EDB, 1,2-D; August 1982 and March 1983; 35 wells.

Study No. 03. Region 5 DBCP well sampling; San Joaquin, Stanislaus, Fresno, Kern, Madera, Merced, Tulare counties; 1979-1984.

Study No. 04. Santa Barbara District, EDB and DBCP well sampling; San Luis Obispo, Santa Barbara, Ventura counties; DBCP: July-September 1979; EDB: October and December 1983.

Study No. 05. Redding District; DBCP well sampling; Butte, Colusa, Sutter, Glenn counties; 1979-1983.

Study No. 23*. Statewide monitoring of municipal and rural wells (AB 1803).

Study No. 28. San Diego region: DBCP well survey; San Diego, San Bernardino, Riverside, Imperial couties; 1979-1984.

III. County Environmental Health Departments

Agency No. 004: Fresno County Health Department

Study No. 17. County-wide DBCP monitoring; 1979-1983.

Study No. 18. County-wide DBCP monitoring, per-owner request; 1981-1983.

IV. STORET data (DWR and USGS data)

Agency No. 005:

Study No. 19. aldrin, chlordane, endrin, 2,4-D, DBCP, DDT, dieldrin, heptachlor, heptachlor epoxide, lindane, methoxychlor, PCP, silvex, toxaphene. DWR and USGS data; Fresno, Kings, Tulare counties; 1975-1983; (22 wells).

V. Regional Water Quality Control Boards (RWQCB)

Agency No. 007:

Study No. 15*. Region 4: various contaminants; Los Angeles and Ventura counties; May and June 1982; (48 wells).

Study No. 21. "CONTROL OF PESTICIDE DISCHARGES TO NORTH COAST WATERS": Staff report from North Coast Region 1 Quality Control Board, February, 1985, 1,2-D and aldicarb analyzed in wells in Del Norte county; January 1983-March 1984.

Study No. 29*. Suspected point source monitoring.

VI. State Water Resources Control Board (SWRCB)

Agency No. 008:

Study No. 16. "1,2-DICHLOROPROPANE (1,2-D) 1,3-DICHLOROPROPENE (1,3-D)", D.B. COHEN, D. GILMORE, C. FISCHER AND Q.W. BOWES: 1,2-D, 1,3-D analyzed in wells in Fresno, Merced and San Joaquin counties; 1982; (95 wells).

Study No. 20. EDB study; Fresno, Kern, Merced, San Joaquin, Santa Barbara, Stanislaus, Tulare, Yolo counties; 1982-1983.

Study No. 24*. Sampling from a specially designed monitoring network.

Study No. 26*. Endosulfan study.

Study No. 27*. PCP field sampling.

* Indicates studies that have been identified with a code number but data will be obtained and included in the inventory at a later date.

APPENDIX B

FORMAT OF DATA SHEETS

The column format of each record in the well inventory data base was (Figure 3).

1	Record header, symbol
2-4	Township
5-7	Range
8-9	Section
10	Tract letter
11-12	Month
13-14	Year
15	Blank space
16-20	Chemical code
21-26	Sample concentration, in ppb. Columns 21-24 represent the first three digits of the concentration in scientific notation. Col. 25 contains exponent sign; Col. 26 contains the exponant.
27	Value code. A = averaged value; 0 = single observation.
28-33	Minimum detectable level, in ppb. Cols, 28-31 contain the first three digits of the detectable level; Col. 32 contains the exponent sign; Col. 33 contains the exponent.
34	Blank space
35-37	Agency code. The agency or organization conducting the study from which the sample is from. See Appendix B for codes of agency names.
38-39	Study code. Studies are numbered consecutively as located and coded. See Appendix II for a bibliographic citation of studies and their corresponding code numbers.
40-41	County code. State numbering system. See Appendix I for list of counties and their corresponding numbers.
42-46	Street number. Will be kept confidential; if well is a municipal well, the well name will be written here.
47-54	Street name. Will be kept confidential.
55	Blank space
56-59	Well depth, in feet.
60-62	Top perforation, in feet.

63-66 Bottom perforation, in feet.

67-70 Water depth = standing water level in well after development (in feet).

71-72 Log year. Year the well was completed.

73 Base meridian. See Appendix B for codes.

74 Well code = well type. See Appendix B for codes.

75-78 Apple file code. Arbitrary name, for tracing back ability.

79-80 Blank spaces

All categories for which data are missing are filled in with dashes "-".

	TOWNSHIP	RANGE	SECTION	TRACT		MONTH	YEAR		CHEMICAL CODE	CHEMICAL CONCEN (ppb) exp.	VALUE CODE	MDL (ppb) exp.	AGENCY CODE	STUDY CODE	COUNTY CODE	STREET NUMBER	STREET NAME		WELL DEPTH (ft.)	TOP PERF (ft.)	BOTTOM PERF (ft.)	WATER DEPTH (ft.)	LOG YEAR	BASE MERIDIAN	WELL CODE	APPLE FILE CODE	
1	2 3 4	5 6	7 8 9	10	11	12 13	14 15	16	17 18 19 20 21	22 23 24 25 26 27	28	29 30 31 32 33 34	35 36 37	38 39	40 41	42 43 44 45 46	47 48 49 50 51 52 53 54	55	56 57 58 59	60 61 62	63 64 65 66	67 68 69 70	71 72	73	74	75 76 77 78 79	80

Figure 3. Coding format for well inventory data.

APPENDIX C

EXPLANATION OF CODES

Description of the codes used in the well inventory data base to identify: I. chemicals; II. agencies; III. separate well sudies; IV. counties; V. T/R/S base meridians and; VI. well type.

I. Chemical Code

00009 aldrin
00045 atrazine
00106 carbofuran
00130 chlordane
00133 chloroform
00183 dibromochloropropane (DBCP)
00184 TDE and isomers (DDD)
00185 Data reported as D-D mix
00186 dichloro diphenyl trichloroethane (DDT)
00210 dieldrin
00259 endosulfan and endosulfan isomers I and II
*0259 endosulfate
00262 endrin
*0262 endrin aldehyde
00271 ethylene dibromide (EDB)
00317 heptachlor
*0317 heptachlor epoxide
00346 dicofol
00359 lindane
00384 methoxychlor
00388 methylene chloride
00465 pentachlorophenol (PCP)
00506 1,2-dichloropropane (1,2-D)
00530 silvex (2,4,5-TP)
00531 simazine
00573 1,3-dichloropropene (1,3-D)
*0573 cis/trans chloroallyl alcohol

00575 aldicarb

00581 tetradifon

00594 toxaphene

00636 2,4-dinitrophenol (2,4-D)

01857 fenamiphos

02092 dichlorodiphenyldichloroethylene and isomer (DDE)

90359 benzene hexachloride (BHC) and isomers other than Lindane (gamma-BHC)

* Indicated breakdown product of compound with same number.

II. Agency Code

Code	Description
001	CDFA, Environmental Hazards Assessment Program
002	CDFA, Worker Health and Safety Program
003	Department of Health Services
004	Fresno County Health Department
005	STORET data: U.S. Geological Survey and DWR information
006*	City of Hanford (Kings County)
007	Regional Water Quality Control Board
008	State Water Resources Control Board
009*	Yolo County Department of Agriculture

* Data not yet included in the inventory.

III. Well Study Code

Code	Agency	Pesticide
01 -	DHS	EDB
02 -	DHS	EDB, 1,2-D
03 -	DHS	DBCP
04 -	DHS	DBCP, EDB
05 -	DHS	DBCP
06 -	CDFA	EDB
07 -	CDFA	DBCP, EDB, 1,3-D, DDD, DDE, DDT, aldrin, chlordane, lindane, heptachlor, heptachlor epoxide, dicofol, tedion, methoxychlor, endosulfan and endosulfan isomers, pentachlorphenol.
08 -	CDFA	atrazine
09 -	CDFA	Telone, DD mix
10 -	CDFA	cis/trans chloroallyl alcohol
11 -	CDFA	1,3-D, cis/trans chloroallyl alcohol, organophosphates and chlorinated hydrocarbons
12 -	CDFA	carbofuran
13 -	CDFA	carbofuran, simazine, DBCP, EDB
14 -	CDFA	aldicarb
15 -	RWQCB	aldrin, BHC-isomers, gamma-BHC (lindane), chlordane, DDD isomer, DDE isomer, DDT isomer, dieldrin, endosulfan, endrin, endrin aldehyde, heptachlor, heptachlor epoxide, toxaphene.
16 -	SWRCB	1,2-D, 1,3-D
17 -	FCHD	DBCP
18 -	FCHD	DBCP
19 -	STORET	aldrin, chlordane, 2,4-D, DBCP, DDT, dieldrin, endrin, heptachlor, heptachlor epoxide, lindane, methoxychlor, PCP, silvex, toxaphene.
20 -	SWRCB	EDB
21 -	RWQCB	1,2-D, aldicarb
22 -	CDFA	1,2-D

The following studies have been identified, but data collection and entry will be completed at a later date:

23 -	DHS	municipal and rural well monitoring data (AB 1803)
24 -	SWRCB	toxics monitoring network data
25 -	CDFA	(EHAP) individual well sampling, upon request.
26 -	SWRCB	endosulfan
27 -	SWRCB	PCP field sampling
28 -	DHS	DBCP (San Diego region)
29 -	RWQCB	suspected point sources monitoring

IV. County Code*

Code	County	Code	County	Code	County
01	Alameda	21	Marin	41	San Mateo
02	Alpine	22	Mariposa	42*	Santa Barbara
03	Amador	23	Mendocino	43*	Santa Clara
04*	Butte	24*	Merced	44*	Santa Cruz
05	Calaveras	25	Modoc	45	Shasta
06*	Colusa	26	Mono	46	Sierra
07*	Contra Costa	27*	Monterey	47	Siskiyou
08*	Del Norte	28	Napa	48*	Solano
09	El Dorado	29	Nevada	49	Sonoma
10*	Fresno	30	Orange	50*	Stanislaus
11*	Glenn	31	Placer	51*	Sutter
12	Humboldt	32	Plumas	52	Tehama
13	Imperial	33*	Riverside	53	Trinity
14	Inyo	34	Sacramento	54*	Tulare
15*	Kern	35	San Benito	55	Tuolumne
16*	Kings	36*	San Bernardino	56*	Ventura
17	Lake	37*	San Diego	57*	Yolo
18	Lassen	38	San Francisco	58	Yuba
19*	Los Angeles	39*	San Joaquin		
20*	Madera	40*	San Luis Obispo		

* Counties with an * are included in the inventory.

V. Base Meridian Code

1 = Mt. Diablo

2 = San Bernardino

3 = Humboldt

VI. Well Type Code

I = Irrigation (agricultural) well

D = Domestic (private) well

M = Municipal well

B = Both I and D

U = Unknown

APPENDIX D

RESULTS BY COUNTY

Summary of pesticides tested for presence of residues in well water, the number of negative and positive results and the total number of records taken for 26 California counties.

COUNTY: BUTTE

PESTICIDE NAME	RECORDS NEG[a]	POS[b]	TOTAL
DBCP	7	0	7
TOTAL	7	0	7

COUNTY: COLUSA

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
DBCP	4	0	4
TOTAL	4	0	4

COUNTY: CONTRA COSTA

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
carbofuran	2	0	2
DBCP	2	0	2
ethylene dibromide	2	0	2
simazine	2	0	2
TOTAL	8	0	8

[a]Number of records with negative results for pesticide residues.
[b]Number of records with positive results for pesticide residues.

COUNTY: DEL NORTE

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
1,2-D	45	79	124
aldicarb	27	42	69
fenamiphos	11	0	11
TOTAL	83	121	204

COUNTY: FRESNO

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
aldrin	2	0	2
carbofuran	47	0	47
chlordane	2	0	2
1,2-D	26	0	26
1,3-D	33	0	33
cis/trans chloroallyl alcohol	2	0	2
2,4-D	1	0	1
DBCP	1522	2257	3779
DDT	2	0	2
dieldrin	2	0	2
endrin	1	2	3
ethylene dibromide	89	2	91
heptachlor	2	0	2
heptachlor epoxide	2	0	2
lindane	4	0	4
methoxychlor	4	0	4
PCP	3	0	3
silvex	1	0	1
simazine	44	2	46
toxaphene	2	0	2
TOTAL	1791	2263	4054

COUNTY: GLENN

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
DBCP	2	0	2
TOTAL	2	0	2

COUNTY: KERN

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
aldicarb	5	0	5
carbofuran	32	0	32
chloroform	1	0	1
1,2-D	52	14	66
DBCP	71	149	220
D-D mix	16	0	16
ethylene dibromide	167	28	195
methylene chloride	1	0	1
simazine	31	0	31
TOTAL	376	191	567

COUNTY: KINGS

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
carbofuran	11	0	11
DBCP	42	6	48
endrin	0	1	1
ethylene dibromide	11	0	11
lindane	0	1	1
simazine	11	0	11
TOTAL	75	8	83

COUNTY: LOS ANGELES

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
aldrin	36	0	36
chlordane	35	0	35
DDD	35	0	35
DDE	35	0	35
DDT	35	0	35
dieldrin	35	0	35
endosulfan	70	0	70
endosulfate	35	0	35
endrin	35	0	35
endrin aldehyde	35	0	35
heptachlor	35	0	35
heptachlor epoxide	35	0	35
lindane	35	0	35
BHC isomers	105	0	105
toxaphene	35	0	35
TOTAL	631	0	631

COUNTY: MADERA

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
carbofuran	10	0	10
chlordane	1	0	1
DBCP	26	8	34
DDD	1	0	1
DDE	1	0	1
DDT	1	0	1
endosulfan	3	0	3
ethylene dibromide	12	0	12
heptachlor	1	0	1
heptachlor epoxide	1	0	1
dicofol	1	0	1
lindane	1	0	1
methoxychlor	1	0	1
simazine	10	0	10
tetradifon	1	0	1
toxaphene	1	0	1
TOTAL	72	8	80

COUNTY: MERCED

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
atrazine	2	0	2
carbofuran	20	0	20
chlordane	1	0	1
chloroform	0	8	8
1,2-D	54	3	57
1,3-D	38	0	38
cis/trans chloroallyl alcohol	3	0	3
DBCP	462	445	907
DDD	1	0	1
DDE	1	0	1
DDT	1	0	1
dicofol	1	0	1
endosulfan	3	0	3
ethylene dibromide	51	4	55
heptachlor	1	0	1
heptachlor epoxide	1	0	1
lindane	1	0	1
methoxychlor	1	0	1
PCP	2	0	2
simazine	20	0	20
tetradifon	1	0	1
toxaphene	1	0	1
TOTAL	666	460	1126

COUNTY: MONTEREY

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
aldicarb	6	0	6
carbofuran	22	0	22
1,2-D	4	0	4
DBCP	22	0	22
ethylene dibromide	27	0	27
simazine	22	0	22
TOTAL	103	0	103

COUNTY: RIVERSIDE

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
carbofuran	10	1	11
chlordane	15	0	15
1,3-D	10	0	10
DBCP	19	7	26
DDD	15	0	15
DDE	15	0	15
DDT	15	0	15
dicofol	15	0	15
endosulfan	45	0	45
ethylene dibromide	21	0	21
heptachlor	15	0	15
heptachlor epoxide	15	0	15
lindane	15	0	15
methoxychlor	15	0	15
PCP	1	0	1
simazine	9	2	11
tetradifon	15	0	15
toxaphene	15	0	15
TOTAL	280	10	290

COUNTY: SAN BERNARDINO

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
carbofuran	12	0	12
DBCP	10	2	12
ethylene dibromide	12	0	12
simazine	12	0	12
TOTAL	46	2	48

COUNTY: SAN DIEGO

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
ethylene dibromide	2	0	2
TOTAL	2	0	2

COUNTY: SAN JOAQUIN

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
atrazine	1	0	1
carbofuran	21	0	21
chloroform	0	7	7
1,2-D	42	13	55
1,3-D	21	0	21
cis/trans chloroallyl alcohol	2	0	2
DBCP	336	297	633
D-D mix	0	1	1
ethylene dibromide	96	2	98
simazine	19	0	19
TOTAL	538	320	858

COUNTY: SAN LUIS OBISPO

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
carbofuran	3	0	3
DBCP	18	0	18
ethylene dibromide	3	0	3
simazine	3	0	3
TOTAL	27	0	27

COUNTY: SANTA BARBARA

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
carbofuran	5	0	5
1,3-D	5	0	5
DBCP	60	0	60
ethylene dibromide	5	0	5
simazine	5	0	5
TOTAL	80	0	80

COUNTY: SANTA CLARA

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
DBCP	8	1	9
TOTAL	8	1	9

COUNTY: SANTA CRUZ

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
carbofuran	7	0	7
DBCP	7	0	7
ethylene dibromide	7	0	7
simazine	7	0	7
TOTAL	28	0	28

COUNTY: SOLANO

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
ethylene dibromide	0	1	1
TOTAL	0	1	1

COUNTY: STANISLAUS

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
carbofuran	12	0	12
chlordane	25	0	25
1,2-D	27	0	27
1,3-D	5	0	5
DBCP	238	261	499
DDD	25	0	25
DDE	25	0	25
DDT	25	0	25
dicofol	25	0	25
endosulfan	75	0	75
ethylene dibromide	59	2	61
heptachlor	25	0	25
heptachlor epoxide	25	0	25
lindane	25	0	25
methoxychlor	25	0	25
PCP	7	0	7
simazine	11	0	11
tetradifon	25	0	25
toxaphene	25	0	25
TOTAL	709	263	972

COUNTY: SUTTER

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
1,2-D	1	1	2
DBCP	21	36	57
TOTAL	22	37	59

COUNTY: TULARE

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
aldrin	1	0	1
carbofuran	23	0	23
chlordane	2	0	2
1,3-D	9	0	9
2,4-D	1	0	1
DBCP	169	260	429
DDD	2	0	2
DDE	2	0	2
DDT	2	0	2
dicofol	2	0	2
endosulfan	6	0	6
endrin	6	1	7
ethylene dibromide	42	0	42
heptachlor	2	0	2
heptachlor epoxide	2	0	2
lindane	10	0	10
methoxychlor	9	0	9
PCP	0	3	3
silvex	4	0	4
simazine	20	2	22
tetradifon	2	0	2
toxaphene	3	0	3
TOTAL	319	266	585

COUNTY: VENTURA

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
aldrin	13	0	13
chlordane	13	0	13
1,3-D	1	0	1
DBCP	68	1	69
DDD	13	0	13
DDE	13	0	13
D-D mix	1	0	1
DDT	13	0	13
dieldrin	13	0	13
endosulfan	26	0	26
endosulfate	13	0	13
endrin	13	0	13
endrin aldehyde	13	0	13
ethylene dibromide	5	0	5
heptachlor	13	0	13
heptachlor epoxide	13	0	13
lindane	13	0	13
BHC isomers	39	0	39
toxaphene	13	0	13
TOTAL	309	1	310

COUNTY: YOLO

PESTICIDE NAME	RECORDS NEG	POS	TOTAL
1,2-D	5	0	5
1,3-D	8	0	8
DBCP	6	0	6
ethylene dibromide	29	0	29
PCP	1	0	1
TOTAL	49	0	49

APPENDIX E

RESULTS BY COUNTY AND BY YEAR

Summaries of negative and positive records for pesticides in well water by year for 26 California counties, 1975 to 1984[a].

COUNTY: BUTTE

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
DBCP	.	.	.	4/0	3/0	.	.	.	.

COUNTY: COLUSA

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
DBCP	.	.	.	3/0	.	.	.	.	.

[a]No records for 1977 were included in the well inventory data base.

COUNTY: CONTRA COSTA

PESTICIDE		NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
		75	76	78	79	80	81	82	83	84
carbofuran	!	.	.	.	.	.	.	2/0	.	.
DBCP	!	.	.	.	.	.	.	2/0	.	.
ethylene dibromide	!	.	.	.	.	.	.	2/0	.	.
simazine	!	.	.	.	.	.	.	2/0	.	.

COUNTY: DEL NORTE

PESTICIDE		NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
		75	76	78	79	80	81	82	83	84
aldicarb	!	.	.	.	.	.	.	.	3/5	1/3
1,2-D	!	.	.	.	.	.	.	.	4/5	2/6
fenamiphos	!	.	.	.	.	.	.	.	.	3/0

COUNTY: FRESNO

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
aldrin	2/0	.	.	.	.	.	.	.	.
carbofuran	.	.	.	.	.	1/0	46/0	.	.
chlordane	2/0	.	.	.	.	.	.	.	.
1,2-D	.	.	.	.	.	.	18/0	7/0	.
1,3-D	.	.	.	4/0	.	7/0	18/0	.	.
cis/trans chloroallyl alcohol	.	.	.	.	.	2/0	.	.	.
2,4-D	.	.	.	.	.	.	1/0	.	.
DBCP	.	.	.	42/65	20/59	335/364	195/298	159/178	3/13
DDT	2/0	.	.	.	.	.	.	.	.
dieldrin	2/0	.	.	.	.	.	.	.	.
endrin	0/1	0/1	.	.	.	.	1/0	.	.
ethylene dibromide	.	.	.	4/0	.	.	44/2	14/0	17/0
heptachlor	2/0	.	.	.	.	.	.	.	.
heptachlor epoxide	2/0	.	.	.	.	.	.	.	.
lindane	2/0	1/0	.	.	.	.	1/0	.	.
methoxychlor	2/0	1/0	.	.	.	.	1/0	.	.
PCP	.	.	.	3/0	.	.	.	.	.
silvex	.	.	.	.	.	.	1/0	.	.
simazine	.	.	.	.	.	.	44/2	.	.
toxaphene	.	1/0	.	.	.	.	1/0	.	.

COUNTY: GLENN

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
DBCP	.	.	.	2/0	.	.	.	.	.

COUNTY: KERN

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
aldicarb	.	.	.	5/0	.	.	.	.	.
carbofuran	.	.	.	.	.	1/0	31/0	.	.
chloroform	.	.	.	.	.	.	.	1/0	.
1,2-D	.	.	.	.	.	.	13/0	26/5	.
DBCP	.	.	.	15/13	7/7	1/7	28/17	3/3	.
D-D mix	.	.	.	.	.	.	.	4/0	.
ethylene dibromide	.	.	.	.	.	.	44/0	45/9	2/4
methylene chloride	.	.	.	.	.	.	.	1/0	.
simazine	.	.	.	.	.	.	31/0	.	.

COUNTY: KINGS

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
carbofuran	.	.	.	.	.	.	11/0	.	.
DBCP	.	.	.	2/3	15/2	1/0	11/0	.	.
endrin	.	.	0/1	.	.	.	.	.	.
ethylene dibromide	.	.	.	.	.	.	11/0	.	.
lindane	.	.	0/1	.	.	.	.	.	.
simazine	.	.	.	.	.	.	11/0	.	.

COUNTY: LOS ANGELES

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
aldrin	.	.	.	.	.	.	34/0	.	.
chlordane	.	.	.	.	.	.	34/0	.	.
DDD	.	.	.	.	.	.	34/0	.	.
DDE	.	.	.	.	.	.	34/0	.	.
DDT	.	.	.	.	.	.	34/0	.	.
dieldrin	.	.	.	.	.	.	34/0	.	.
endosulfan	.	.	.	.	.	.	34/0	.	.
endosulfate	.	.	.	.	.	.	34/0	.	.
endrin	.	.	.	.	.	.	34/0	.	.
endrin aldehyde	.	.	.	.	.	.	34/0	.	.
heptachlor	.	.	.	.	.	.	34/0	.	.
heptachlor epoxide	.	.	.	.	.	.	34/0	.	.
lindane	.	.	.	.	.	.	34/0	.	.
BHC isomers	.	.	.	.	.	.	34/0	.	.
toxaphene	.	.	.	.	.	.	34/0	.	.

COUNTY: MADERA

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
carbofuran	.	.	.	.	.	.	10/0	.	.
chlordane	.	.	.	1/0	.	.	.	.	.
DBCP	.	.	.	9/2	1/1	0/1	9/2	1/0	0/2
DDD	.	.	.	1/0	.	.	.	.	.
DDE	.	.	.	1/0	.	.	.	.	.
DDT	.	.	.	1/0	.	.	.	.	.
dicofol	.	.	.	1/0	.	.	.	.	.
endosulfan	.	.	.	1/0	.	.	.	.	.
ethylene dibromide	.	.	.	.	.	.	10/0	.	2/0
heptachlor	.	.	.	1/0	.	.	.	.	.
heptachlor epoxide	.	.	.	1/0	.	.	.	.	.
lindane	.	.	.	1/0	.	.	.	.	.
methoxychlor	.	.	.	1/0	.	.	.	.	.
simazine	.	.	.	.	.	.	10/0	.	.
tetradifon	.	.	.	1/0	.	.	.	.	.
toxaphene	.	.	.	1/0	.	.	.	.	.

COUNTY: MERCED

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
atrazine	.	.	.	.	.	2/0	.	.	.
carbofuran	.	.	.	.	.	.	20/0	.	.
chlordane	.	.	.	1/0	.	.	.	.	.
chloroform	.	.	.	.	.	.	0/6	.	.
1,2-D	.	.	.	.	.	.	11/3	17/0	.
1,3-D	.	.	.	.	.	7/0	14/0	.	.
cis/trans chloroallyl alcohol	.	.	.	.	.	2/0	.	.	.
DBCP	.	.	.	20/20	54/57	28/34	82/39	36/33	17/13
DDD	.	.	.	1/0	.	.	.	.	.
DDE	.	.	.	1/0	.	.	.	.	.
DDT	.	.	.	1/0	.	.	.	.	.
dicofol	.	.	.	1/0	.	.	.	.	.
endosulfan	.	.	.	1/0	.	.	.	.	.
ethylene dibromide	.	.	.	.	.	.	18/0	17/3	5/0
heptachlor	.	.	.	1/0	.	.	.	.	.
heptachlor epoxide	.	.	.	1/0	.	.	.	.	.
lindane	.	.	.	1/0	.	.	.	.	.
methoxychlor	.	.	.	1/0	.	.	.	.	.
PCP	.	.	.	1/0	.	.	.	.	.
simazine	.	.	.	.	.	.	20/0	.	.
tetradifon	.	.	.	1/0	.	.	.	.	.
toxaphene	.	.	.	1/0	.	.	.	.	.

COUNTY: MONTEREY

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
aldicarb	.	.	.	6/0	.	.	.	.	.
carbofuran	.	.	.	.	.	.	22/0	.	.
1,2-D	.	.	.	.	.	.	.	4/0	.
DBCP	.	.	.	.	.	.	22/0	.	.
ethylene dibromide	.	.	.	.	.	.	22/0	4/0	.
simazine	.	.	.	.	.	.	22/0	.	.

COUNTY: RIVERSIDE

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
carbofuran	.	.	.	.	.	.	10/1	.	.
chlordane	.	.	.	7/0	.	.	.	.	.
1,3-D	.	.	.	5/0	.	.	.	.	.
DBCP	.	.	.	4/3	.	.	7/4	.	.
DDD	.	.	.	7/0	.	.	.	.	.
DDE	.	.	.	7/0	.	.	.	.	.
DDT	.	.	.	7/0	.	.	.	.	.
dicofol	.	.	.	7/0	.	.	.	.	.
endosulfan	.	.	.	7/0	.	.	.	.	.
ethylene dibromide	.	.	.	5/0	.	.	11/0	.	.
heptachlor	.	.	.	7/0	.	.	.	.	.
heptachlor epoxide	.	.	.	7/0	.	.	.	.	.
lindane	.	.	.	7/0	.	.	.	.	.
methoxychlor	.	.	.	7/0	.	.	.	.	.
PCP	.	.	.	1/0	.	.	.	.	.
simazine	.	.	.	.	.	.	9/2	.	.
tetradifon	.	.	.	7/0	.	.	.	.	.
toxaphene	.	.	.	7/0	.	.	.	.	.

COUNTY: SAN BERNARDINO

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
carbofuran	.	.	.	.	.	.	12/0	.	.
DBCP	.	.	.	.	.	.	10/2	.	.
ethylene dibromide	.	.	.	.	.	.	12/0	.	.
simazine	.	.	.	.	.	.	12/0	.	.

COUNTY: SAN DIEGO

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
ethylene dibromide	.	.	.	.	.	.	.	2/0	.

COUNTY: SAN JOAQUIN

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
atrazine	.	.	.	.	.	1/0	.	.	.
carbofuran	.	.	.	.	.	2/0	19/0	.	.
chloroform	.	.	.	.	.	.	0/5	.	.
1,2-D	.	.	.	.	.	.	10/3	10/1	.
1,3-D	.	.	.	6/0	.	5/0	6/0	.	.
cis/trans chloroallyl alcohol	.	.	.	.	.	2/0	.	.	.
DBCP	.	.	.	25/21	50/30	8/18	47/40	3/20	0/14
D-D mix	.	.	.	.	.	.	0/1	.	.
ethylene dibromide	.	.	.	6/0	.	.	20/0	36/1	1/1
simazine	.	.	.	.	.	.	19/0	.	.

COUNTY: SAN LUIS OBISPO

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
carbofuran	.	.	.	.	.	.	3/0	.	.
DBCP	.	.	.	7/0	.	.	3/0	.	.
ethylene dibromide	.	.	.	.	.	.	3/0	.	.
simazine	.	.	.	.	.	.	3/0	.	.

COUNTY: SANTA BARBARA

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
carbofuran	.	.	.	.	.	.	5/0	.	.
1,3-D	.	.	.	.	.	5/0	.	.	.
DBCP	.	.	.	37/0	.	.	5/0	.	.
ethylene dibromide	.	.	.	.	.	.	1/0	3/0	.
simazine	.	.	.	.	.	.	5/0	.	.

COUNTY: SANTA CLARA

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
DBCP	.	.	.	.	.	5/1	.	.	.

COUNTY: SANTA CRUZ

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
carbofuran	.	.	.	.	.	.	7/0	.	.
DBCP	.	.	.	.	.	.	7/0	.	.
ethylene dibromide	.	.	.	.	.	.	7/0	.	.
simazine	.	.	.	.	.	.	7/0	.	.

COUNTY: SOLANO

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
ethylene dibromide	.	.	.	.	.	.	.	0/1	.

COUNTY: STANISLAUS

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
carbofuran	.	.	.	.	.	1/0	11/0	.	.
chlordane	.	.	.	20/0	.	.	.	.	.
1,2-D	.	.	.	.	.	.	.	22/0	.
1,3-D	.	.	.	5/0	.	.	.	.	.
DBCP	.	.	.	52/47	28/20	11/6	50/24	2/10	0/6
DDD	.	.	.	20/0	.	.	.	.	.
DDE	.	.	.	20/0	.	.	.	.	.
DDT	.	.	.	20/0	.	.	.	.	.
dicofol	.	.	.	20/0	.	.	.	.	.
endosulfan	.	.	.	20/0	.	.	.	.	.
ethylene dibromide	.	.	.	5/0	.	.	10/0	31/2	.
heptachlor	.	.	.	20/0	.	.	.	.	.
heptachlor epoxide	.	.	.	20/0	.	.	.	.	.
lindane	.	.	.	20/0	.	.	.	.	.
methoxychlor	.	.	.	20/0	.	.	.	.	.
PCP	.	.	.	7/0	.	.	.	.	.
simazine	.	.	.	.	.	.	11/0	.	.
tetradifon	.	.	.	20/0	.	.	.	.	.
toxaphene	.	.	.	20/0	.	.	.	.	.

COUNTY: SUTTER

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
1,2-D	.	.	.	.	.	.	.	0/1	.
DBCP	.	.	.	1/1	1/3	0/2	.	1/1	.

COUNTY: TULARE

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
aldrin	.	1/0	.	.	.	.	.	.	.
carbofuran	.	.	.	.	.	1/0	22/0	.	.
chlordane	.	.	.	2/0	.	.	.	.	.
1,3-D	.	.	.	3/0	.	.	.	.	.
2,4-D	.	.	.	.	1/0	.	.	.	.
DBCP	.	.	.	18/23	43/33	8/13	24/16	3/11	0/4
DDD	.	.	.	2/0	.	.	.	.	.
DDE	.	.	.	2/0	.	.	.	.	.
DDT	.	.	.	2/0	.	.	.	.	.
dicofol	.	.	.	2/0	.	.	.	.	.
endosulfan	.	.	.	2/0	.	.	.	.	.
endrin	.	5/1	.	.	1/0	.	.	.	.
ethylene dibromide	.	.	.	3/0	.	.	22/0	1/0	4/0
heptachlor	.	.	.	2/0	.	.	.	.	.
heptachlor epoxide	.	.	.	2/0	.	.	.	.	.
lindane	.	7/0	.	2/0	1/0	.	.	.	.
methoxychlor	.	6/0	.	2/0	1/0	.	.	.	.
PCP	.	.	0/3	.	.	.	.	.	.
silvex	.	3/0	.	.	1/0	.	.	.	.
simazine	.	.	.	.	.	.	20/2	.	.
tetradifon	.	.	.	2/0	.	.	.	.	.
toxaphene	.	.	.	2/0	1/0	.	.	.	.

COUNTY: VENTURA

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
aldrin	.	.	.	.	.	.	12/0	.	.
chlordane	.	.	.	.	.	.	12/0	.	.
1,3-D	.	.	.	1/0	.	.	.	.	.
DBCP	.	.	.	38/1	.	.	.	.	.
DDD	.	.	.	.	.	.	12/0	.	.
DDE	.	.	.	.	.	.	12/0	.	.
D-D mix	.	.	.	1/0	.	.	.	.	.
DDT	.	.	.	.	.	.	12/0	.	.
dieldrin	.	.	.	.	.	.	12/0	.	.
endosulfan	.	.	.	.	.	.	12/0	.	.
endosulfate	.	.	.	.	.	.	12/0	.	.
endrin	.	.	.	.	.	.	12/0	.	.
endrin aldehyde	.	.	.	.	.	.	12/0	.	.
ethylene dibromide	.	.	.	1/0	.	.	.	3/0	.
heptachlor	.	.	.	.	.	.	12/0	.	.
heptachlor epoxide	.	.	.	.	.	.	12/0	.	.
lindane	.	.	.	.	.	.	12/0	.	.
BHC isomers	.	.	.	.	.	.	12/0	.	.
toxaphene	.	.	.	.	.	.	12/0	.	.

COUNTY: YOLO

PESTICIDE	NUMBER OF NEGATIVE/POSITIVE RECORDS FOR EACH YEAR								
	75	76	78	79	80	81	82	83	84
1,2-D	.	.	.	.	.	.	.	5/9	.
1,3-D	.	.	.	8/0	.	.	.	.	.
DBCP	.	.	.	6/0	.	.	.	.	.
ethylene dibromide	.	.	.	8/0	.	.	.	20/0	.
PCP	.	.	.	1/0	.	.	.	.	.